Pathology

Wilt Resistant Chickpea Lines in Maharashtra State, India

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Wilt caused by *Fusarium oxysporum* f.sp. *ciceri* is the most important disease of chickpea. In India, about 10% loss in chickpea grain yield due to wilt is a regular occurrence. Use of resistant varieties is the most economical way to avoid such yield losses. At Rahuri, a wilt sick plot was developed according to the method described by Nene et al. (1981) to screen chickpea genotypes for resistance to wilt.

Over 200 chickpea lines from the All India Coordinated Pulses Improvement Project, Kanpur, and ICRISAT, Patancheru were screened in the wilt sick plot during the 1990/91 and 1991/92 postrainy seasons. Screening was done by sowing two test lines of 5 m length alternating with one row of the susceptible control (JG 62) in two replications. For each line 50 seeds were sown. The disease incidence was recorded at 15-day intervals until maturity. The percent wilt incidence was calculated on the basis of number of plants wilted in each line.

The "sickness" of plot was uniformly high as indicated by 100% wilting of the control cultivar. Of the 200 lines tested, GL 86152, ICC 11320, ICC 11322, and ICC 14303 were highly resistant (0-10% wilt incidence). Eight lines, viz., H 82-2, H 86-156, ICC 11323, ICC 14309, ICC 15167, ICCV 90001, KWR 108, and Phule G 81-1-1 were resistant (11-20%). Several lines, H 86-72, ICC 15166, ICCV 88108, ICCV 89244, ICCV 90002, ICCV 90201, and KWR 10 were moderately susceptible (21-30%), and AKG 33, BG 357, BG 477, ICCV 10, ICCV 38, ICCV 89314, ICCV 89344, ICCV 89402, and ICCV 90254 were susceptible (31-50%). The remaining 166 lines were highly susceptible (51-100%).

Reference

Nene, Y.L., Haware, M.P., and **Reddy, M.V.** 1981. Chickpea diseases: resistance-screening techniques. Information Bulletin no. 10. Patancheru, A.P. 502 324, India: International Crops Research Institute for the Semi-Arid Tropics. 12 pp.

Evaluation of Wild *Cicer* Species for Resistance to Four Chickpea Diseases

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In chickpea (*Cicer arietinum*), sources of resistance to wilt [*Fusarium oxysporum* Schl. emend Snyd. & Hans. f.sp. *ciceri* (Padwick) Snyd. & Hans.] and dry root rot [*Rhizoctonia bataticola* (Taub.) Butler] are available (Nene and Haware 1980, Haware *et al.* 1992). However, we could not identify good levels of resistance to collar rot (*Sclerotium rolfsii* Sacc.), ascochyta blight [*Ascochyta rabiei* (Pass.) Labr.], and botrytis gray mold (*Botrytis cinerea* Pers. ex Fr.) diseases. There are indications that resistance to some of these diseases may be found in wild *Cicer* species. There are also reports of interspecific cross successes in *Cicer* species (Ladizinsky and Adler 1976, and Pundir *et al.* 1992), suggesting that some of the wild *Cicer* species can be utilized to broaden the genetic base and enhance levels of resistance to stress factors of cultivated chickpea. Therefore 36 accessions belonging to seven wild annual *Cicer* species were evaluated for resistance to wilt, collar rot, ascochyta blight and botrytis gray mold at ICRISAT Center.

Pathologists at ICRISAT have developed screening techniques to identify resistance to all major diseases of chickpea (Nene *et al.* 1981). For wilt screening, potting medium was prepared according to the method suggested by Haware and Nene (1982). Inoculum was prepared from a single spore culture of *F. oxysporum* f.sp. *ciceri*, multiplied for 14 days on 100 g of 9:1 sand:chickpea meal in a 250 mL flask. The inoculum thus prepared was mixed with autoclaved 1:1 soil (Vertisol):sand mixture @ 100 g inoculum to 2 kg soil medium in a 15-cm plastic pot. Eight seeds were sown in each pot and, after emergence, the seedlings were thinned to 5 per pot. Plants were observed for 60 days for wilt symptoms, and at the time of final rating, plants were excavated and their roots were cleaned in water and checked for internal discoloration.

For collar rot, the potting medium was prepared by mixing 20-day-old inoculum of the pathogen grown on sorghum straw with soil (Vertisol) in metal tray (70 × 30 × 16 cm). The inoculum was mixed with the soil @ 100 g to 4 kg soil. Five seeds were sown in a row in each container.

Screening of wild *Cicer* for reaction to ascochyta blight and botrytis gray mold was done in a controlled environment room. Fifteen-days-old seedlings raised in 10-cm diameter plastic pots (5 seedlings pot^{-1}) were inoculated with a spore suspension prepared from 15-days-

Table 1. Reactions of wild *Cicer* spp to wilt, collar rot, ascochyta blight, and botrytis gray mold in greenhouse experiments at ICRISAT Center, 1991/92.

			Percent mortality[1]		Disease rating[1] (1-9 scale)	
Acc No.	*Cicer* species	Identity	Wilt	Collar rot	AB	BGM
ICCW 1	*C. yamashitae*	JM 2021	100.0	100.0	9.0	9.0
ICCW 2	*C. yamashitae*	JM 2022	100.0	100.0	8.0	9.0
ICCW 7	*C. bijugum*	JM 2103	NT[2]	NT	6.0	NT
ICCW 41	*C. bijugum*	No. 200	100.0	73.3	3.6	3.0
ICCW 42	*C. bijugum*	No. 201	100.0	53.3	3.6	4.0
ICCW 71	*C. bijugum*	ILWC 32-2	53.3	70.0	5.3	5.6
ICCW 72	*C. bijugum*	ILWC 42-2	13.3	46.7	6.3	5.3
ICCW 91	*C. bijugum*	LR 51	80.0	73.3	7.0	4.0
ICCW 47	*C. cuneatum*	SL 157	100.0	86.6	6.6	6.6
ICCW 33	*C. judaicum*		100.0	66.7	3.0	7.0
ICCW 34	*C. judaicum*	No. 182	NT	NT	3.0	NT
ICCW 35	*C. judaicum*	No. 183	NT	NT	3.0	NT
ICCW 36	*C. judaicum*	No. 185	NT	NT	3.0	NT
ICCW 73	*C. judaicum*	ILWC 43-1	20.0	93.3	5.0	7.3
ICCW 74	*C. judaicum*	ILWC 43-2	100.0	100.0	7.6	7.0
ICCW 75	*C. judaicum*	ILWC 44-2	100.0	100.0	3.3	8.0
ICCW 76	*C. judaicum*	ILWC 45	100.0	100.0	4.3	6.6
ICCW 77	*C. judaicum*	ILWC 46	100.0	93.3	6.0	6.3
ICCW 80	*C. judaicum*	ILWC 48-1	100.0	86.6	6.3	8.3
ICCW 82	*C. judaicum*	ILWC 48-3	86.6	100.0	7.0	7.0
ICCW 89	*C. judaicum*	Tetraploid	100.0	80.0	4.0	6.0
ICCW 90	*C. judaicum*	Haldad	100.0	100.0	3.0	7.3
ICCW 92	*C. judaicum*	LR 126	20.0	73.3	6.0	7.3
ICCW 93	*C. judaicum*	LR 135	86.6	73.3	6.0	7.3
ICCW 96	*C. judaicum*	BMW 23-9	66.6	73.3	5.3	7.3
ICCW 97	*C. judaicum*	BMW 26-1	60.0	93.3	4.6	7.6
ICCW 11	*C. pinnatifidum*	JM 2123	100.0	100.0	4.3	7.6
ICCW 37	*C. pinnatifidum*	No. 188	NT	NT	3.6	8.0
ICCW 38	*C. pinnatifidum*	No. 189	20.0	93.3	3.6	7.3
ICCW 85	*C. pinnatifidum*	ILWC 49-1	100.0	93.3	4.0	7.3
ICCW 86	*C. pinnatifidum*	ILWC 49-2	100.0	86.7	4.0	7.6
ICCW 88	*C. pinnatifidum*	JM 2054	20.0	86.7	3.6	8.0
ICCW 94	*C. pinnatifidum*	LR 193	93.3	66.7	4.0	8.0
ICCW 95	*C. pinnatifidum*	LR 198	60.0	63.3	9.0	7.6
ICCW 48	*C. reticulatum*	JM 2106 A-1	100.0	45.0	7.3	7.3
ICCW 44	*C. echinospermum*	No. 204	13.3	73.3	9.0	6.0
ICC 4918[3]	*C. arietinum*	Annigeri	NT	100.0	NT	NT
ICC 4951[4]	*C. arietinum*	JG 62	100.0	NT	NT	NT
ICC 4954[5]	*C. arietinum*	H 208	NT	NT	NT	9.0
ICC 4991[6]	*C. arietinum*	Pb 7	NT	NT	9.0	NT

1. Average of three replications (5 plants replication^{-1}).

2. NT = Not tested.

3-6. Susceptible to collar rot, wilt, botrytis gray mold (BGM), and ascochyta blight (AB), in that order.

old cultures. In the controlled envirionment, 95% relative humidity (RH) was maintained for the first 3 days after inoculation, and 70-75% RH subsequently. For ascochyta blight screening the temperature was maintained at 20 (±1)°C and for gray mold screening, temperature was 25 (±1)°C. The disease reactions were recorded at 15 days after inoculation using a 1-9 rating scale (1 = free from disease and 9 = killed).

Most of the accessions of wild *Cicer* were susceptible to fusarium wilt, and all were susceptible to collar rot. Only *C. bijugum* (ICCW 72) and *C. echinospermum* (ICCW 44) showed low incidence of wilt (13.3%). Resistance (3-4 rating) to ascochyta blight was observed in several accessions of *C. judaicum*, two accessions of *C. bijugum*, and six accessions of *C. pinnatifidum*. However, all accessions of *C. judaicum* were susceptible to botrytis gray mold. Three accessions of *C. bijugum* were resistant to botrytis gray mold and two of these (ICCW 41 and ICCW 42) were also resistant to ascochyta blight (Table 1).

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Evaluation of Chickpea Lines for Resistance to Root Rot and Wilt in Northwestern Ethiopia

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In northwestern Ethiopia, root rot and wilt are major and widely distributed diseases of chickpea (Bekele Hunde 1990). A sick plot was developed at Adet Research Center using diseased plants collected from Bahir Dar, Mota, Bichena, and Dabre Tabor districts which were incorporated @ 20 sacks ha^{-1} in an isolated field of 2000 m^2. The process was repeated in 1988 and 1989. In these years, two successive crops of the highly susceptible local cultivar were sown in the field during August and September. In 1989 there was 100% mortality indicating successful sick plot development. Since diseased plants were collected from many locations, it was expected that the sick plot thus developed would contain various wilt and root rot pathogens (*Fusarium oxysporum* f.sp. *ciceri*, *Rhizoctonia bataticola*, *R. solani*, and *Sclerotium rolfsii*).

During the 1990/91 season, 45 chickpea lines received from ICRISAT and the Plant Genetic Resource Centre, Ethiopia (PGRC/E) were sown in the sick plot in September in single rows of 4 m with two replications in a randomized-block design. In each row 40 seeds were sown. The susceptible variety JG 62 was sown after every 10 test rows. In 1991/92, 68 chickpea lines received from ICRISAT, ICARDA, and PGRC/E (desi and kabuli) and including three lines from the previous year's trial showing <20% disease incidence, and 19 selections made at Adet, were screened in a nonreplicated trial. The trial was sown in October using 2-row test plots. Observations on mortality due to wilt and root rot were recorded at 15 days after emergence. Isolations were also made on potato dextrose agar medium from dead plants selected randomly throughout the field. The lines were characterized as follows:

Disease incidence <10%	=	Resistant
11-20%	=	Moderately resistant
21-50%	=	Susceptible
>50%	=	Highly susceptible

Three chickpea lines - ICC 14400, ICC 12241, and ICC 12445 - showed <20% mortality in both the years (Table 1). Seven lines showing <20% mortality in 1991/92 were ICCL 84204, ICCL 85221, ICCL 88001, ICC 12884, ICCL 84215, ICC 12205, and ICC 12408. All the kabuli lines were found to be highly susceptible.